

University of Pittsburgh
Pittsburgh, PA

Institute of NanoScience and Engineering

Hong Koo Kim, PhD, Co-Director, kim@engr.pitt.edu
David Snoke, PhD, Co-Director, snoke@pitt.edu



CORE FACILITIES

SYNTHESIS

Facilities are available for organic/inorganic materials synthesis and processing, such as crystalline colloidal assembly, nanoparticles, nanosized tubes, pores, wires and ribbons (carbon, oxide, semiconductor, metal, polymer, etc.)

FABRICATION

Extensive facilities are available, starting from wafer cleaning to micro/nanoscale fabrication, integration and packaging, including thin-film deposition (CVD, MBE, sputter, PVD), UV holographic lithography, photolithography (Karl Suss MJB3 and MA/BA6 with backside alignment), wet and dry etching (Unaxis ICP-RIE), oxidation/annealing, and packaging.

CHARACTERIZATION

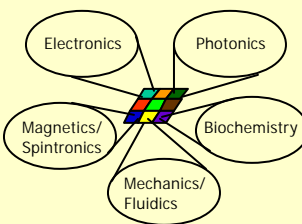
A broad spectrum of analysis/characterization instruments and techniques are available including: atomic force microscopes (Digital Instruments D3100 with electrochemical and phase imaging capabilities, DI multimode, and Asylum MFP-3D), atom probe field ion microscope, apertureless near-field infrared scanning microscopes, time-resolved photoemission electron microscope, scanning tunneling microscopes (VT-STM), nano-workbench (4-tip STM probe combined with SEM), time-resolved UV Raman spectroscopy, TEM (JEOL 200CX and 2000FX STEM with EDS and EELS), SEM (Philips XL-30 field emission with EDS, EBSD and OIM), XRD (Philips X'pert), MFM, DLTS, FTIR, TGA, etc.

COMPUTATIONAL

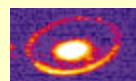
The facilities are for research and education in the use of computational methods in the design and characterization of new molecules and materials. The core facilities include: 50-processor IBM RS6000 Power3 computer cluster with a gigabit Ethernet connection for parallel calculations for modeling complex systems, 32-processor Pentium III cluster and 38-processor Athlon cluster, and three HP Itanium 2 computers for large memory/large disk applications.

RESEARCH PROJECTS

Nanosystems-on-a-chip based on nanochannel arrays formed with directed self-assembly



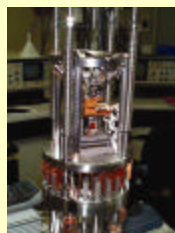
Excitons in semiconductor nanostructures



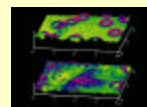
Nanoscale oxidation processes on metal and semiconductor surfaces



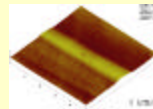
Chemistry of carbon nanotubes and nanomanipulation (nano-workbench)



Apertureless nearfield scanning infrared microscopy for identifying the chemical composition of nanostructures



Nanomechanics of oxide nanobelts



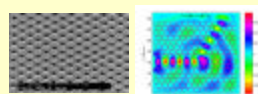
Colloids for optical switching, memories and chemical sensors



Nanotribology: Molecular interlayers and abrasive wear



Nanophotonic devices on nanostructured wafers



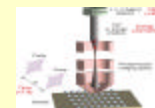
Nanotube and nanorod self-assembly



ABOUT THE INSTITUTE

The Institute's vision is to solve large, complex scientific and engineering challenges in this burgeoning field by facilitating interdisciplinary teams drawn from the faculty in the School of Engineering, Arts and Sciences and the Schools of Health Sciences, and to educate the next generation of scientists through a world-class integrated program of innovative knowledge generation. The Institute was established by the University in 2002, and currently over 30 faculty members perform various research in nanoscience and engineering, funded by federal government, state and industry. The Institute also serves the industrial interests by forming industrial partner groups and seeking opportunities for sharing discoveries with the commercial sector.

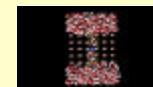
Ultrafast time-resolved electron microscopy of nanostructured electronic materials



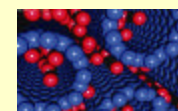
Quantum information processing



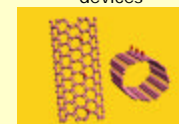
Laser-control of electron transport through molecular wires



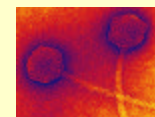
Hydrogen storage in carbon nanotubes



Water in nanoscale channels and electronic properties of nanoscale devices



Bacterial nanomachines



Tissue engineering, cardiovascular biomaterials



Bone tissue engineering

